



Prenatally detected thoracic neuroblastoma

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Neuroblastoma is the most common pediatric extracranial solid tumor derived from primitive neural crest cells of the sympathetic nervous system. Although one-fifths of all neuroblastomas occurs within the thorax, thoracic neuroblastomas detected in fetus have been rarely reported. We report a case of fetal thoracic neuroblastoma with massive pleural effusion detected with prenatal ultrasonography. A 34-year-old Korean second-gravida was referred to our hospital at 30 weeks of gestation for evaluation, after the right lung mass found in the fetus. Approximately 3 cm, well-defined, hyperechoic mass was found in the right thorax with right pleural effusion, with the initial suspicion of teratoma. However, as mass continued to grow with deteriorating pleural effusion and fetal hydrops, the mass was considered malignant after 3 weeks. After a cesarean delivery, an approximately 4 cm mass with peripheral calcification and hemothorax was found on neonatal ultrasonography. Neuroblastoma was diagnosed on excision biopsy.

Keywords: Fetus; Neuroblastoma; Mediastinum; Thorax; Neoplasms

Introduction

Neuroblastoma is the most common pediatric extracranial solid tumor derived from primitive neural crest cells of the sympathetic nervous system [1,2]. Of all neuroblastomas, 75% arises in the abdomen, 20% in the thorax, and 5% in the neck. Primary tumors can occur anywhere along the sympathetic chain from the neck to the pelvis [2]. The clinical manifestations depend on the primary location of the tumor and the extent of metastatic disease [2,3]. Although neuroblastoma is a common tumor in the perinatal period, few cases of fetal thoracic neuroblastoma have been reported [4-6]. Thoracic neuroblastoma often causes respiratory difficulties in neonatal period and the treatment options for neuroblastoma includes surgical resection with or without adjuvant chemotherapy due to its metastatic property, so it is important to detect fetal thoracic neuroblastoma prenatally [1-3]. Hence, we are reporting this case to share an experience of prenatal detection of thoracic neuroblastoma.

mass in the fetus. The mother had no significant complication in her previous pregnancy and no other antenatal problem was reported in this pregnancy before 30 weeks of gestation. A 32×31 mm, well-defined calcified hyperechoic mass in the right thorax with hypoechogenic right pleural effusion was detected on antenatal ultrasonography at our hospital, which was initially suspected to be a teratoma (Fig. 1A). The fetal thoracic mass increased in size up to 39×32 mm and the amount of right pleural effusion increased during 3 weeks of evaluation (Fig. 1B). Fetal hydrops including 7 mm deep ascites and generalized subcutaneous edema developed at 33 weeks of gestation (Fig. 1C). No other significant defect in fetal structure was found. Fetal surveillance tests, includ-

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Case report

A 33-year-old second-gravida was referred to a tertiary care center at 30 weeks of gestation for evaluation of a right lung



Fig. 1. (A) An irregularly shaped hyperechoic solid mass with calcification was detected in the transabdominal sonographic image of the sagittal section of the right thorax of the fetus at 30 weeks of gestation. (B) The irregularly shaped hyperechoic solid mass increased in size compared with the previous examination, with massive hydrothorax at 33 weeks of gestation. (C) Ascites in the abdominal cavity was found around the fetal liver, with subcutaneous edema of the abdominal wall, and these were considered suggestive findings of malignancy.

ing biophysical profiling and non-stress test were conducted. Minimal variability was noted on the non-stress test.

A male baby weighing 2,780 g was delivered through an emergency cesarean section owing to non-reassuring fetal heart beat patterns, and admitted to the neonatal intensive care unit with Apgar score 3 at 1 minute and 5 at 5 minutes. No metastatic lesion was found in the placenta and umbilical cord. Initial neonatal hemoglobin from arterial blood was 12.6 g/dL, neonatal hemoglobin dropped to 9.4 g/dL after thoracentesis. Initial neonatal red cell distribution width was slightly increased (18.9%), which suggests fetal anemia was due to the hemorrhage of the tumor. Bone marrow biopsy revealed

no metastasis to bone marrow.

Contrast-enhanced computed tomography of the chest revealed a 40×40×30 mm enhanced tumor in the right thorax with bilateral hemothorax causing mediastinal shifting to the left, which was considered a posterior mediastinal teratoma or neurogenic tumor (Fig. 2A). Moreover, multiple hepatic metastases were suspected on magnetic resonance imaging (Fig. 2B) and abdominal ultrasonography. The neuro-specific enolase (NSE) level was 78.7 ng/mL. At 7 days after delivery, neuroblastoma was diagnosed on excision biopsy of the right thoracic lesion followed by surgical excision of the thoracic mass, which revealed massive hemothorax. A diagnosis of a

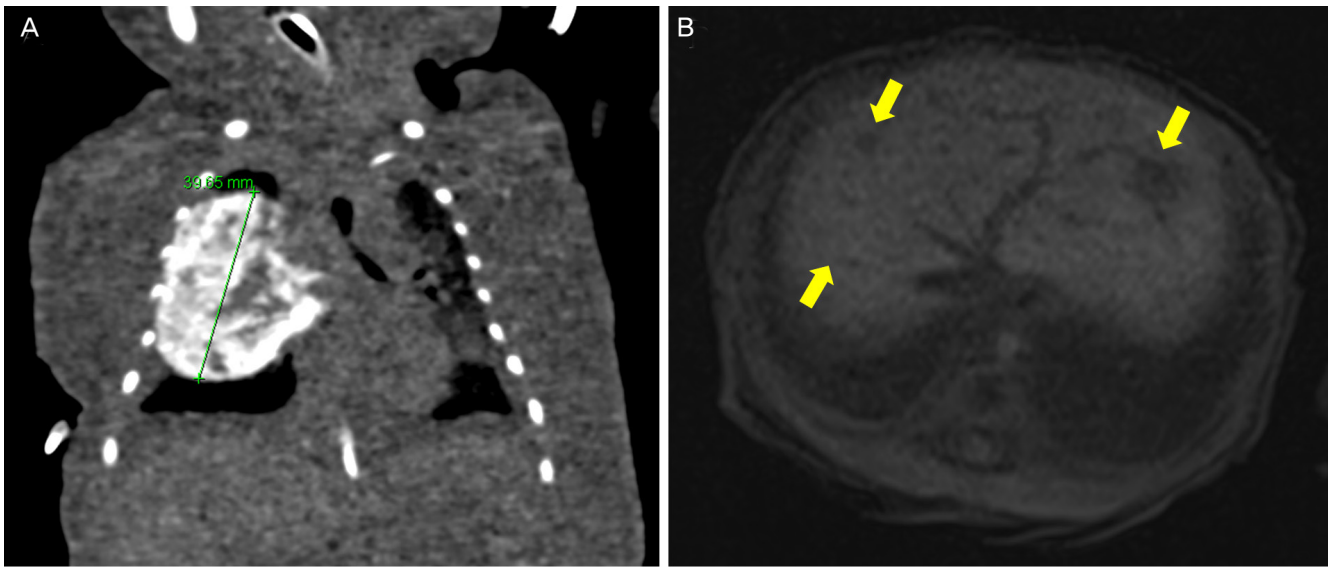


Fig. 2. (A) Postnatal evaluation with chest computed tomography showed a highly attenuated mass with calcification and massive hydrothorax. (B) Neonatal magnetic resonance imaging of the liver showed multiple nodules with low signal intensity (arrows) in both lobes of the liver, suggesting multiple hepatic metastasis.

primary thoracic neuroblastoma with liver metastasis was confirmed and no amplification of N-myc proto-oncogene (*MYCN*) was detected.

The patient completed 8 courses of chemotherapy administered every 3 weeks. NSE was monitored as a marker of disease progression. No evidence of local recurrence or metastasis was found on the magnetic resonance image after 6 months of chemotherapy. This patient developed normally.

Discussion

Most space-occupying lesions discovered in the thoracic cavity during prenatal ultrasound are bronchopulmonary malformations (BPMs). Congenital cystic adenomatoid malformation and pulmonary sequestration represent >85% of BPMs. These congenital malformations are usually intraparenchymal, with cystic, solid or mixed (cystic and solid) form. The main differential diagnosis of BPM is diaphragmatic hernia [7].

True thoracic neoplasms often develop within the mediastinum. Lymphangioma is one of most common mediastinal tumors, and it rapidly develops within the anterior mediastinum. An enlarged mass can lead to fetal hydrops and polyhydramnios. Another common mediastinal tumor is a teratoma, which can be calcified and contain hemorrhagic areas [7-9]. Furthermore, neuroblastoma is another condition that could

occur in the posterior mediastinum.

Although thoracic neuroblastomas account for a minority of all neuroblastoma cases (11%–26%), they remain the most common mediastinal mass in patients aged <2 years [10]. Thoracic neuroblastoma has a relatively favorable prognosis and is generally associated with better outcomes than neuroblastomas arising in other areas. Although the mechanism for the more favorable prognosis is unclear, it is known that thoracic neuroblastomas tend to be detected at an earlier age and present with a higher frequency of localization at the time of diagnosis than non-thoracic neuroblastomas [10,11].

The reported clinical manifestation of thoracic neuroblastomas is severe respiratory distress due to tracheal compression by the tumor. However, this does not apply to fetuses because fetuses in the uterus do not need to breathe through their respiratory system. As Moppett et al. [12] had reported in 1999, 2 of 33 cases of neuroblastomas from their cases and reviewed literature originated from the thorax without prenatal ultrasound detection. Those thoracic neuroblastomas were incidentally diagnosed after respiratory distress occurred in the neonatal period. Although the patients survived after thoracotomy, they had comorbidities with complications such as abnormal sweating and flaccid paralysis of the lower limbs [4,12]. In 10 of 134 (7.5%) newborns in the Italian registry, neuroblastomas arose from the thorax and only 20% of neuroblastomas regardless of location were prenatally detected [6].

Fetal hydrops is a comorbidity of fetal neuroblastomas [12,13]. Hydrops associated with a neuroblastoma could be due to anemia from bone marrow replacement or hemorrhage from the tumor. Other proposed causes are the compression of the vena cava leading to the obstruction of venous return from neoplastic hepatomegaly, or a large tumor [14,15].

Most of the previously reported thoracic neuroblastomas were diagnosed in the perinatal period due to neonatal respiratory distress. This case adds an additional value as it was detected prenatally even before the onset of neonatal distress. Also, this case includes 15 months follow up of the clinical course.

Conflict of interest

No potential conflict of interest relevant to this article was reported.

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